REPORT

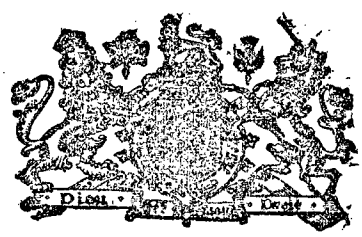
ON THE

Agricultural Station, Orai, Jalaun,

OF THE

UNITED PROVINCES OF AGRA AND OUDH.

FOR THE YEAR ENDING JUNE 30th, 1908.



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No. 1441F. of 1908.

From

W. H. MORELAND, Esq., C.I.E., I.C.S.,
Director of Land Records and Agriculture,
United Provinces,

To

The CHIEF SECRETARY to GOVERNMENT,
United Provinces,

Dated Cawnpore, the 29th of September 1908.

Sir,

I have the honour to submit the report on the Orai Agricultural Station for the year ending 30th June 1908. The report is written by Mr. B. C. Burt, the Deputy Director in charge of the Central Agricultural Circle, as he assumed charge only at the end of the year, the report is necessarily a compilation of the records and of information supplied by the station staff.

I have the honour to be,
Sir,
Your most obedient servant,
W. H. MORELAND,
Director.

Report on the Agricultural Station, Orai, Jalaun, for the year ending June 30th, 1908.

CHAPTER I.

(1) PRINCIPAL OBJECTS OF THE STATION.

Cotton.—A botanical examination of cotton collected from different parts of Bundelkhand, and an examination in the proportion of the different types, their selection and trial from an economic point of view.

Wheat.—(I) An attempt at selection of rust resisting wheat grown under special conditions conducive to rust, conducted with seed obtained from all parts of the Provinces and sown on a considerable area.

(II) Trial of wheats bred at Cawnpore as to suitability to the Jalaun district and as regards rust resistance.

Linseed.—Work as above in connection with wheat. Dutch, Russian, Australian and country varieties are under trial, the former three for purposes of crossing should they prove, as claimed, rust resistant.

Juars.—Classification of Bundelkhand juars together with an experimental enquiry into the different district varieties most suitable for distribution as seed locally in times of scarcity.

Trial in the transference of juar, bajra, wheat, and gram seed from other parts of the Provinces in case of importation being necessary in times of scarcity.

Kans.—Experimental trials in connection with *kans* eradication.

Famine fodder.—Propagation of spineless cactus, etc., on waste land.

Trial of implements.

Miscellaneous.

(2) SITUATION, AREA AND SOILS.

The experimental station is situated about one mile from the Orai Railway Station, on the Great Indian Peninsula Railway, and about an equal distance from the Orai Collectorate.

The land has been acquired by Government and the necessary buildings have been erected by the Department. The whole area in possession is 8·86 acres, out of which 13·91 acres have been utilized for building purposes, &c. A distributary of the Betwa Canal supplies water to all parts, but is only available after the setting in of the rains and up to the month of December, and is liable in years of deficient rainfall to be insufficient. The construction of additional reservoirs at the head of the canal is expected largely to remedy these defects.

The site for experimental work was chosen as being easily approached by rail, near a railway station, and comprising blocks of land fairly representing the four principal soils of Bundelkhand, at the same time separated by no great distance from each other and the office buildings.

The four principal soils of Bundelkhand are *mar*, *kabar*, *pandua* and *rakar*.

Mar block lies to the south-east, about a mile from the buildings in the village of Kuinyan.

Mar.—Is a strong black calcareous loam specially noted for its large deep cracks in the hot weather, its power of absorbing water during the rains and friability when being worked. Lumps of *mar* fracture with a distinct grain, showing small granules of lime and readily breaking down with time and light showers of rain. This soil is chiefly devoted to wheat or wheat and gram. By custom it is never generally manured and requires no irrigation in ordinary years.

Kabar block lies a few furlongs to the north-east of buildings in the village of Ikhala s-pur.

Kabar.—Is a dark (usually) clay soil, lighter in colour than, and inferior in quality to, the best *mar*, and generally contains small black pellets which consist apparently chiefly of iron with smaller quantities of silica, manganese oxide, magnesia and lime. It may also contain small nodules of lime. Sticky and cohesive when wet, on drying it hardens and ploughs up with difficulty in large lumps which give a smooth fracture and do not readily break down.

It differs somewhat in colour and clayeness in different localities and sometimes receives such prefixes as *Loha-kabar*, *Hara-kabar*, &c., in consequence. At the experimental station it is contiguous to *mar* and shades off gradually from this soil. It is devoted chiefly to wheat and gram, mixed, in the rabi and juar, cotton, &c., according to season in the kharif.

Parwa block lies to the east of the building, about two miles off in the village of Minora Kalpi.

Pandua or Parwa.—Compared with *kabar* it is a light loam. It varies somewhat in colour and quantity with its position, manuring and with different districts and may be *khaki*, brown, clayish coloured or even have a reddish tinge. Easy to work and responding readily to water and manuring it will grow most crops with these facilities. Without irrigation the principal rabi crop is gram and barley mixed.

Rakar block lies a few furlongs to the north-west of the buildings and is also in the village of Iklaspur.

Rakar (Stony).—No doubt so called in consequence of the presence of *kankar* nodules. It is found on slopes and along ravines and represents a degraded soil, the result of denudation by running water and the deposit elsewhere of its best material. It varies somewhat with the kind of soil from which it is derived and the amount of erosion to which it has been subjected. Thus we have *mota-rakar* and *patla-rakar*, terms sometimes used loosely, sometimes represented by other names in different places, but which define clearly enough differences in quality that undoubtedly exist. It grows poor crops of juar and bajra in the kharif, or gram and the poorer pulses in the rabi.

The following shows the complete analyses carried out by Dr. Leather, Imperial Agricultural Chemist, of *mar*, *parwa*, *kabar* and *rakar* soils :—

Constituents.	*Mar.*		*Parwa.*		*Kabar.*		*Rakar.*	
	Surface soil 6″.	Sub-soil 6″.	Surface soil 6″.	Sub-soil 6″.	Surface soil 6″.	Sub-soil 6″.	Surface soil 6″.	Sub-soil 6″.
Insoluble silicates and sand ...	74·74	73·96	86·38	84·28	75·93	75·49	76·91	71·35
Ferric oxide	5·59	5·78	3·26	4·25	5·55	5·79	4·74	5·60
Alumina...	9·23	8·57	5·42	5·54	9·45	9·68	7·43	8·33
Lime	2·38	2·49	·69	·75	1·78	1·42	2·96	4·84
Magnesia	1·40	2·05	·71	·66	1·27	·96	1·26	1·41
Potash	·81	·74	·52	·45	·86	·90	·65	·74
Soda	·55	·15	·22	·68	·23	·04	·16	·35
Phosphoric acid	·30	·08	·03	·02	·07	·07	·10	·10
Sulphuric acid	·007	·008	·007	·007	·02	·02	·02	·03
Carbonic* acid	·09	·35	·09	·02	·28	·22	·56	1·07
Organic matter and combined water.	4·90	5·82	2·67	3·34	4·56	5·41	5·21	6·08
	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Total nitrogen % ...	·04	·04	·04	·03	·039	·031	·036	·028
Available phosphoric acid % ...	·010	·008	·014	·007	·0068	·0049	·0042	·0004
Available potash%	·015	·016	·011	·008	·031	·009	·015	·020
*Equivalent to calcium carbonate %	...	...	...	...	·63	· 49	1·27	2·45

The following shows the mechanical analyses of *mar* and *parwa* soils and sub-soils :—

Diameter.		*Mar.*		*Parwa.*	
		Surface soil.	Sub-soil.	Surface soil.	Sub-soil.
Sand	>·25 M. M. ...	1·85	2·0	·3	·7
	·25—·032 „ ...	31·90	28·45	46·30	43·9
	·032—·016 „ ...	35·1	35·7	30·05	30·8
	·016—·008 „ ...	7·1	9·75	6·40	7·25
	·008—·004 „ ...	7·6	8·4	5·75	6·0
	·004—·002 „ ...	11·0	11·1	8·00	7·9
	<·002″ ...	1·35	1·05	·85	·85

The following shows the mechanical analyses of the *kabar* and *rakar* soils and sub-soils :—

Diameter (millimeter).		*Kabar.*		*Rakar.*	
		Surface soil 6′.	Sub-soil 6′.	Surface soil 6′.	Sub-soil 6″.
Sand	>·16 M. M. ...	3·07	4·04	6·19	6·20
	·032— ·16 „ ...	33·95	34·79	37·89	30·81
	·016 — ·032 „ ...	33·03	31·65	31·75	32·12
	·008 — ·016 „ ...	9·70	9·54	7·85	9·80
	·004 — ·008 „ ...	6·90	6·78	5·54	7·54
	·002 — ·004 „ ...	4·51	5·01	4·11	5·32
Clay	<·002 „ ...	·68	·66	·55	·48

* These soils contain comparatively very little fine material.

CHAPTER II.

TRIALS OF DIFFERENT VARIETIES OF CROPS.

Cotton.—The trials this year were limited to the comparison of Bani and Jalaun *kapas*.

Statement showing outturns of Jalaun kapas and Bani duplicated on four parwa plots in 1907 and 1908.

Name of variety.	Outturn in lbs. per acre.		Remarks.
	1907.	1908.	
Bani ...	97	90	The Bani crop was late both years and attacked by insects.
Jalaun *kapas* ...	291	207	
Bani ...	71	115	
Jalaun *kapas* ...	262	169	

The outturns for the two years show that Bani is not suitable to the Jalaun district.

Ground nuts.—Five varieties, Madras, Spanish, Virginia, Pondicherry and Japanese were again tried on *parwa* The season was an unusually bad one, rain stopping in August and no irrigation being possible until the end of September. By this time many of the shoots had dried up, but after irrigating and hoeing new flowers appeared and nuts formed. Before these could mature properly rain fell and the nuts were dug as the ripe ones were beginning to germinate.

Statement showing outturns of different varieties of ground nuts in lbs. per acre in 1907 and 1908.

Serial number.	Name of variety.	Outturn in lbs. per acre.	
		1907.	1908.
1	Madras ...	881	95
2	Spanish pea nut ...	1,107	685
3	Virginia ...	1,586	590
4	Pondicherry ...	1,332	570
5	Japanese, small ...	230	725

One plot was sown on *mar* but failed to germinate owing to excessive rain shortly after sowing.

The nuts found a ready market locally. There has been considerable enquiry for seed and it seems likely that the crop will become popular in the Jalaun district.

Wheat.—The comparison of F (S)^2, an early wheat originally received from the late Mr. Farrer but selected and acclimatised at Cawnpore, with local Kathia was continued. The outturns were as follows :—

Outturn in lbs. per acre (grain).

	Mar.				*Kabar.*			
	Irrigated.*		Unirrigated.		Irrigated.*		Unirrigated.	
	1907.	1908.	1907.	1908.	1907.	1908.	1907.	1908.
Kathia ...	730	410	685	517	590	320	643	240
FS^2 ...	520	430	553	451	544	240	330	360

*In the year under report all wheats were sown with canal *paleo* owing to the failure of the rains. No subsequent irrigation was possible as the canal was closed in September.

Pissia and Malwa wheats were also sown on duplicate plots of $\frac{1}{10}$th acre on *parwa*, the latter also on *mar* for comparison.

The outturns in lbs. per acre were as follows:—

Variety.	Parwa.		*Mar.*	
	A.	B.	A.	B.
Pissia ...	180	300	...	...
Malwa ...	250	420	560	450

The following wheats, highly recommended for their milling qualities by the Manager of the Ganges Flour Mills, were sown on duplicate plots of $\frac{1}{20}$th acre on *mar* for comparison of outturn.

The outturns in lbs. per acre are given below :—

Variety.	Indian H.	Muzaffar-nagar bald.	Indian P.	Etawah A.	Indian K.	Fifes Indian.
Duplicate A ...	666	717	686	553	676	717
Duplicate B ...	512	615	604	656	604	635

Comparison of Cawnpore and local gram.

This was carried out on duplicate plots on *mar* and *kabar*.

The outturns in lbs. per acre are given below :—

Crop.	*Mar.*		*Kabar.*	
	A.	B.	A.	B.
Cawnpore ...	410	390	112	133
Local ...	530	510	143	141

Bundelkhand Juars.

The botanical description and grouping of these having been completed last year, the different varieties were sown on small plots, widely separated, on *parwa* in order to obtain sufficient seed for comparison of outturn.

Unfortunately the greater part of the crop was destroyed by rats, only a few heads being obtained.

The juar crop being practically a failure throughout Bundelkhand, except in a few irrigated areas, the collection of fresh material was not undertaken.

CHAPTER III.

MISCELLANEOUS.

The common blue agave (Agave Vera Cruz) as a famine fodder.—Bulbils and suckers were planted out in August on *rakar* and survived in spite of the unusually bad season, the suckers doing better than the bulbils.

Spineless Cactus (Opuntia Ficus Indica).—The propagation of this plant at Cawnpore was continued and sufficient plants have been obtained to plant a considerable area of *rakar* in the coming year. A certain number are also being planted out on *parwa* to provide against total extinction in the event of a failure of the *rakar* crop.

Selection of wheat for resistance to rust.—No work along these lines was possible, the wheats this year were free from rust, and no experiments under artificial rust conditions were possible owing to the lack of canal water.

Linseed rust.—A few crosses between local and Russian, Dutch and Australian linseeds were made, and the seeds from these crosses will be sown during the coming year.

Kans-killing.—No flooding experiments were possible owing to the lack of canal water. The plots were ploughed with the country plough and rain water allowed to accumulate. The amount collected was totally insufficient and the kans was hand-picked and the plots cropped in *rabi* with canal *paleo*.

One plot was ploughed and cross ploughed by the plough with vertical cutter, recently described in the Agricultural Journal of India as found useful in the Central Provinces, and then with the country plough. The Central Provinces plough was found to be a distinct improvement on the country plough for the removal of *kans*.

Trial of farmyard manure on mar.

Farmyard manure at 100 maunds per acre was applied to two duplicate plots of *mar*. The plots together with two unmanured plots were sown with a mixture of Kathia wheats and local gram.

The outturns are given below in lbs. per acre :—

Manured	...	...	...	492
Unmanured	...	...	...	410
Manured	...	...	...	317
Unmanured	...	...	...	230

Trials of implements.—Trials of various ploughs for *kans* infested land have been continued. The Central Provinces plough, already mentioned, has proved to be of considerable service, but the best form for this purpose has still to be determined.

Comparison of country and Watts ploughs on parwa.—This was carried on on duplicate plots, the crop being Pisia wheat. The outturns are as follows :—

Serial number.	Name of plough.	Outturn in lbs. per acre.
1	Watts	235
2	Country ...	148
3	Watts	230
4	Country ...	230

This experiment will be continued.

Comparison of Surat drill and Bakkhar for cotton.

Jalaun *kapas* was sown on duplicate plots by both methods. The season was however unfavourable to cotton.

The outturns for 1907 and 1908 are as follows :—

Serial number.	Method.	Outturn in lbs. per acre.		
		1907,		1908.
		Parwa.	Kabar.	Parwa.
1	Drill	184	164	54
2	Broadcast ...	374	194	56
3	Drill	61	148	101
4	Broadcast ...	287	169	30

Distribution of implements.—Applications for about 60 chain pumps on hire were received, but owing to the heavy demand throughout the province only 23 pumps and two Baldeo Tank Water-lifts could be supplied. They were much appreciated during the short time for which the canal was open.

Two chaff cutters were purchased by local zamindars.

Distribution of seed.—A shortage of good cotton seed being anticipated for the coming year, arrangements were made to purchase one thousand rupees

worth of the best *kapas* available. This was hand ginned at Rath and the seed, after hand picking, sold to cultivators, centres being formed at Banda, Hamirpur, Karwi and Orai. In most places the seed was eagerly taken up especially in the Hamirpur district.

The following seeds were distributed from the farm during the course of the year,—small quantities gratis, larger quantities at market rates—Maize, ground-nuts, juar, bajra, oats, cotton, wheat, gram.

Bulls.—Three bulls were kept on the farm during the year and one was lent to a zamindar. They proved unsuitable to the district and are being put to work.

The present stock was brought from the Banda district where this breed is much valued, but the cultivators of the Jalaun district apparently prefer the type found in the Cawnpore district.

CAWNPORE :
26th August 1908.

B. C. BURT,
Deputy Director of Agriculture.

APPENDIX A.

Character of the season and rainfall.—The past year has seen a striking combination of adverse conditions. The rains began a month late, the first heavy fall occurring in the last few days of July. They were unusually persistent during August (twenty-one rainy days out of twenty-eight); this caused damage to several crops. From August 28th there was no rain until the middle of January when it did little good to the rabi crops on the farm. The juar crop was almost a failure throughout the division and owing to absence of rain the only possible *rabi* sowings were those done with *paleo*.

Further the Betwa Canal was only able to supply water for about a fortnight in September.

Rainfall from June 1st, 1907, to May 31st, 1908.

Month and date.	Total per day.	Total per month.	Month and date.	Total per day.	Total per month.
1907.			1907.		
June 12th ...	·11		August 10th ...	·83	
„ 26th ...	·07		„ 11th ...	·53	
„ 30th ...	·57	·75	„ 12th ...	·34	
July 3rd ...	·03		„ 14th ...	·04	
„ 10th ...	·22		„ 15th ...	·97	
„ 21st ...	·20		„ 16th ...	·20	
„ 24th ...	·20		„ 17th ...	·04	
„ 25th ...	·32		„ 18th ...	·12	
„ 26th ...	·10		„ 21st ...	·10	
„ 27th ...	·08		„ 22nd ...	·14	
„ 29th ...	·82		„ 25th ...	·26	
„ 30th ...	·34		„ 26th ...	·19	
„ 31st ...	2·50	4·81	„ 27th ...	·01	
August 1st ...	·10		„ 28th ...	·55	8·53
„ 2nd ...	2·28		1908.		
„ 3rd ...	·09		January 11th ...	·63	·63
„ 6th ...	·65		February 1st ...	·16	·16
„ 7th ...	·61		April 13th ...	·99	·99
„ 8th ...	·45		May 13th ...	·20	·20
„ 9th ...	·03				

Mean temperature at the Orai Agricultural Station.

Month.			Under shade.		In the open.		Remarks.
			Maximum.	Miaimum.	Maximum.	Minimum.	
June	1907	First-half ...	111·7	84·6	115·4	80·7	Average for 15 days.
		Second „ ...	108·6	82·4	111·7	80·0	„ 15 „
July	1907	First „ ...	110·2	86·6	113·4	83·6	„ 15 „
		Second „ ...	99·5	83·2	104·3	80·0	„ 16 „
August	1907	First „ ...	93·4	78·5	99·3	76·0	„ 15 „
		Second „ ...	91·0	77·2	95·2	75·0	„ 16 „
September	1907	First „ ...	99·3	76·1	104·9	74·1	„ 15 „
		Second „ ...	102·5	74·7	109·9	71·1	„ 15 „
October	1907	First „ ...	104·8	70·1	113·5	66·5	„ 15 „
		Second „ ...	98·4	62·6	114·2	57·3	„ 16 „
November	1907	First „ ...	96.3	59·4	116·3	51·0	„ 15 „
		Second „ ...	90·9	50·3	110·8	45·3	„ 15 „
December	1907	First „ ...	81·4	43·0	102·7†	39·6	„ 15 „
		Second „ ...	78·9	39·6	103·4	38·6	„ 16 „
January	1908	First „ ...	77·5	45·2	94·3	42·2	„ 15 „
		Second „ ...	74·3	45·5	92·3	43·9	„ 16 „
February	1908	First „ ...	80·2	49·4	88·5	47·4	„ 15 „
		Second „ ...	90·6	50·7	103·3	49·4	„ 14 „
March	1908	First „ ...	90·2	50 0	98·4	46·9	„ 15 „
		Second „ ...	100·3	63·9	103·6	61·1	„ 16 „
April	1908	First „ ...	107·3	74·4	110·4	68·5	„ 15 „
		Second* „ ...	111·6	73·3	116·2	70·7	„ 12 „
May	1908	First „ ...	112·0	76·9	no record.	no record.	„ 15 „
		Second „ ...	114·9	80·7			„ 15 „

* Average for 12 days only. † Average for 3 days only.

APPENDIX B.

Statement showing the average outturn per acre of rabi crops during the year 1907-08 and the area from which the average has been taken.

Crop.	Mar.		Kabar.		Parwa.		Rakar.	
	Area in acres.	Outturn in lbs. per acre.	Area in acres.	Outturn in lbs. per acre.	Area in acres.	Outturn in lbs. per acre.	Area in acres.	Outturn in lbs. per acre.
Pissia wheat, pure	·6	608	·2	650	·2	246	...	... *
Kathia wheat and gram ...	·8	451	·6	323	...	...	...	...
Gram	·6	420	·6	88	·5	191	...	...
Oats	·4	348	·2	263	·2	184	...	...
Bejhra, barley and gram ...	·2	463	·4	418	·2	415	...	...

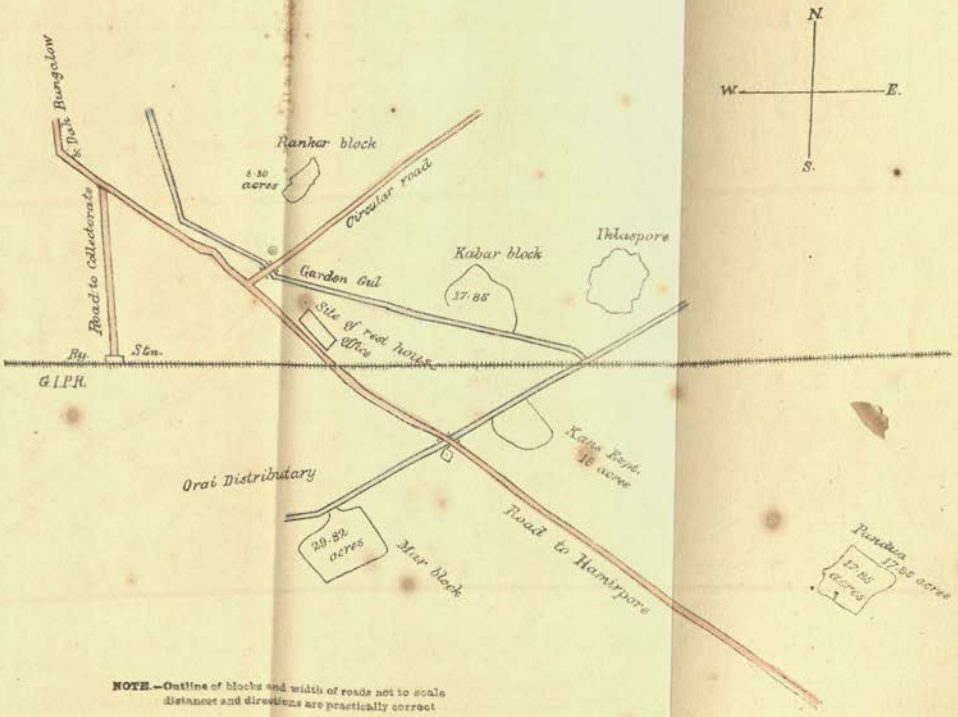
* Rakar crop failed completely.

APPENDIX B.

MAP

SITE OF GOVERNMENT EXPERIMENTAL STATION ORAI (JALAUN),

Scale—1 Mile=4 Inch.



NOTE.—Outline of blocks and width of roads not to scale distances and directions are practically correct

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